SPACE TECHNOLOGY

Industrial and Commercial Applications

VOLUME 12 1992

VOLUME CONTENTS AND AUTHOR INDEX

PERGAMON PRESS Oxford · New York · Seoul · Tokyo

SPACE TECHNOLOGY
Industrial and Commercial Applications
An International Journal

Editor-in-Chief
Professor R. MONTI
Institute of Aerodynamics, Naples University, P. le V. Tecchio 80, 80125 Naples, Italy

---

Founding Editor
Professor L. G. NAPOLITANO

Managing Editor
R. Fortezza, MARS Center, Via Diocleziano 328, 80125 Naples, Italy

Associate Editors

P. Castruccio, Ecosystem, P.O. Box 225, Gambrills, MD 21054, U.S.A.
B. J. Edelson, Johns Hopkins University, SAIS, Foreign Policy Institute, 1740 Massachusetts Avenue NW, Washington, DC 20036, U.S.A.
E. Galloway, 4612 29th Place NW, Washington, DC 20008, U.S.A.
A. Lebeau, 2 Avenue Jeanne d'Arc, 94110 Arcueil, France
G. Pardoe, General Technology Systems Ltd, Brunel Science Park, Kingston Lane, Uxbridge, Middlesex UB8 3PQ, U.K.
G. Seibert, ESA Headquarters, 8–10 rue Mario Nikis, F-75738 Paris Cedex 15, France

Editorial Advisory Board

D. Abir, Tel-Aviv University, School of Engineering, Tel-Aviv 69978, Israel
E. V. Benton, Physics Dept, San Francisco University, San Francisco, CA 94117, U.S.A.
C. Buongiorno, Agenzia Spaziale Italiana, Viale Regina Margherita 202, 00198 Rome, Italy
C. Ciliberto, Rector of Naples University, Naples, Italy
M. B. Collins, Department of Oceanography, The University, Southampton SO9 5NH, U.K.
H. Curien, 24 Rue de Sasset-S. Jacques, 75005 Paris, France
S. Dahwan, ISRO Headquarters, Cauvery Bhavon, District Office Road, Bangalore 560 009, India
J. Fellows, British National Space Centre, R16 Building, Royal Aerospace Establishment, Farnborough, Hants GU14 6TD, U.K.
R. Gibson, Residence les Hesperides, 51 allée Jean de Beins, F-34000 Montpellier, France
G. Greger, Federal Ministry for Research & Technology, Postfach 20076, D-5300 Bonn 2, Germany
L. Guerriero, Agenzia Spaziale Italiana, Via di Villa Patriza 13, 00161 Rome, Italy
J. D. Hodge, International Management & Aerospace Consultants, 1105 Challedon Road, Great Falls, VA 22066, U.S.A.
C. de Jager, Laboratorium voor Ruimte-Onderzoek, Sorbonnel 2, NL-3584 CA Utrecht, The Netherlands
Y. Kuroda, NASDA, World Trade Center Bldg, 2-4-0 Hamamatsu-Cho, Minato-ku, Tokyo 105, Japan
J. S. MacDonald, MacDonald Dettwiler, 13800 Commerce Parkway, Richmond, B.C., Canada V6V 2J3
R. Malina, Leonardo, 2030 Addison St, Suite 400, Berkeley, CA 94704, U.S.A.
H. Ochiai, Toba Merchant Marine College, Toba City, Mie-ken, Japan
W. L. Pritchard, Satellite Systems Engineering Inc., Suite 521E, 7315 Wisconsin Avenue, Washington, DC 20014, U.S.A.
A. Pryor, Director General, British National Space Centre, Room 803, Millbank Tower, London SW1P 4QU, U.K.
K. Serafimov, Department of Astronomy, National Astronomical Observatory, 72 Lenin Blvd, 1784 Sofiya, Bulgaria
M. Trella, ESA Headquarters, 8–10 rue Mario Nikis, F-75738 Paris Cedex 15, France
E. Vallerani, Alenia Spazio, Corso Marche 41, 10146 Torino, Italy

---

Publishing Office
Pergamon Press Ltd, Pergamon House, Bampfylde Street, Exeter EX1 2AH, England (*Tel.* Exeter (0392) 51558; *Fax* (0392) 425370).

Subscription and Advertising Office
North America: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.; *Rest of the World*: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, England (*Tel.* Oxford (0865) 794141).

Subscription Rates
Annual institutional subscription rate (1992): £185.00 (US$335.00). Two-year institutional rate (1992/93): £351.50 (US$636.50). Sterling prices are definitive. U.S. dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice. Subscription rates for Japan are available on request.

Back Issues
Back issues of all previously published volumes, in both hard copy and on microform are available direct from Pergamon Press offices.

Published Quarterly in January, April, July and October

Copyright © 1992 Pergamon Press Ltd

VOLUME CONTENTS

Volume 12, Number 1

Lawrence H. Kuznetz	1	Mars mission gravity profile simulation experiment
Joachim Gülpen and **Jochen Graf**	9	The Columbus Free Flying Laboratory
C. Bonnet, J. Puech and **M. Rigault**	21	Deployable structure for the entry aerodynamic braking decelerator system of planetary probes
Hartmut Janczikowski and **H. J. Sprenger**	31	In orbit technology experiments
David G. Cooke and **David Hunter**	35	Operations procedure planning tools for Space Station robotics task analysis
U. Becker and **L. Kerstein**	45	An evolutionary approach towards unmanned orbital servicing
Toru Tanabe and **Shoji Yoshikawa**	57	Autonomous space robot concept with learning capabilities: laboratory demonstration of peg-in-hole by bi-arm
R. R. Schwab, G. Andrei and **F. A. Hewitt**	67	Installation technologies for winged launcher configurations
K. Maeda and **O. Ryuguji**	83	Japanese contribution to development of Earth environment monitoring system by using satellites
R. W. Berwin, D. T. Cuddy, J. E. Hilland and **B. Holt**	91	Design, test, and applications of the Alaska SAR Facility

Volume 12, Number 2

COLUMBUS VII SYMPOSIUM ON SPACE STATION UTILIZATION

C. Ciliberto	105	Introduction
D. Friske	107	Welcome Address

PROGRAMME STATUS OF COLUMBUS AND SSF

Jean-Marie Luton	109	1991 Ministerial Meeting: reflections and expectations
Fredrik Engström	113	Columbus programme overview
Giuseppe Giampalmo	117	Columbus Ground Segment and operations
J. J. Dordain	123	Synthesis of the different aspects of Columbus utilization
Luciano Guerriero	125	Italian Space Agency prospects

Klaus Berge 127 German prospects

Richard H. Kohrs 131 Space Station program status

THE SCIENTIFIC COMMUNITY: REQUIREMENTS AND NEEDS

E. Kaldis 133 Requirements and needs in the field of materials science in space

I. Martínez 135 Fluid science requirements for Columbus

Guglielmo Antonutto and **Pietro E. di Prampero** 145 Human physiology in microgravity: an overview

ELEMENT CAPABILITY

D. Heyland and **H. M. Kappler** 149 Evaluation of Columbus Attached Laboratory (APM) capabilities against two facility/experiment scenarios

Ernesto Vallerani, Saverio Lioy and **Luigi D'Emiliano** 155 The Columbus Attached Laboratory capabilities

REPORTS ON PAYLOAD DEVELOPMENT

Paul Clancy 167 The microgravity laboratories for Columbus: status and prospects

R. Monti 169 Fluid Science Laboratory

Henk Olthof and **Eberhard Schulz-Lüpertz** 175 Space science using Columbus (5) external payloads

UTILIZATION SUPPORT ACTIVITIES

R. Monti, G. Naja and **R. Fortezza** 181 Utilization support activities: Telescience

K. Heimann, D. Heyland, G. Schmitz, E. Bennett, K. D. Schmidt, W. Geist and **K. H. Sill** 189 MARCO/HOLOP-telescience on the D-2 mission as a preparation for Columbus

Ph. Willekens, C. Hoehne, L. Carotenuto, V. De Chiara, C. Mirra, F. M. Sacerdoti and **R. Vicinanza** 197 MARS-MEC: integration of MARS microgravity databank in CUIS

George P. Haskell 201 European external payloads on Columbus and SSF

Simonetta Di Pippo 203 Automation and robotics for Columbus utilization

K. Wittmann and **M. Gaida** 209 USO concepts in the member states: Germany

A. Loria, C. Mirra and **L. D'Angelo** 213 Columbus user support organization concept in Italy

Patricio De Las Morenas 219 USO definition team

M. C. Limbourg 221 USO concept in the member states: Belgium

F. B. Visser 225 USO concept in the member states: The Netherlands

Thomas A. E. Andersen 229 USO concept in the member states: Denmark

Erik Tillberg and **Christian Lockowandt** 235 Swedish User Support for Columbus

Tor-Henning Iversen	239	USO concept in the member states: Norway
	243	Appendix A—ESA–ESRIN contribution to the Columbus VII Symposium
	245	Appendix B—Scientific Programme
	249	Appendix C—List of Participants and their Affiliations

Volume 12, Number 3

J. C. Guillaumon, M. Subias, J. C. Mandeville and **A. Paillous**	255	Spacecraft materials in their actual flight environment
H. W. Babel, K. E. David and **C. A. Jones**	261	Material considerations for Space Station Freedom
A. De Agostini, A. Puccio and **G. Zanotti**	273	A European Advanced Data Relay System
Jean-Yves Prado, Michel Delpech, Jacques Tailhades, Thierry Blais, Michel Noudelmann and **Gérard Clement**	289	BAROCO: a testbed for the preparation of Columbus payloads operations
Sajjad H. Durrani, Dorothy C. Perkins and **P. Douglas Carlton**	293	Expert systems and advanced automation for space missions operations
U. Apel	305	Key elements and technologies for lunar and Mars applications in the frame of post-Columbus manned European scenarios
Delma C. Freeman Jr, Richard W. Powell and **Robert D. Braun**	313	Manned Mars aerobrake vehicle design issues

Volume 12, Number 4

R. C. Parkinson and **C. M. Hempsell**	325	Cost impacts of supporting a future European Space Station
Kazuo Matsumoto and **Yasushi Horikawa**	333	Overview of the JEM Program
Pat Wilhelm and **George Butler**	341	Space Station Data Management System architecture
Dietrich E. Koelle and **Heribert Kuczera**	353	Sänger space transportation system—progress report
Leonard D. Jaffe and **Jean-Pierre Lebreton**	369	The CRAF/Cassini science instruments, spacecraft, and missions
Michael C. Simon and **Paul H. Bialla**	393	Analysis of alternative infrastructures for Lunar and Mars exploration